

PROFIBUS DP Slave / MPI Unit and CANopen Slave Unit User Manual

10/2019

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Table of Contents



	Safety Information	5
	About the Book	7
Chapter 1	Overview	9
	Package Contents	10
	Certifications and Standards	11
	Federal Communication Commission Radio Frequency Interference Statement - For USA	13
	Hazardous Location Installation - For USA and Canada	14
	European (CE) Compliance and KC Markings	16
Chapter 2	Device Connectivity	17
	System Design	17
Chapter 3	Parts Identification and Functions	21
	Parts Identification	22
	LED Indications	24
Chapter 4	Specifications	27
4.1	General Specifications	28
	Electrical Specifications	29
	Environmental Specifications	30
	Structural Specifications	31
4.2	Functional Specifications	32
	Transmission Specifications	32
4.3	Interface Specifications	34
	Interface Connection	35
	Fieldbus Interfaces	36
Chapter 5	Dimensions	39
	External Dimensions	40
	Dimensions with Cables	41
Chapter 6	Installation	43
	Installation Procedures	43
	Index	45

Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This manual describes how to use this product.

Validity Note

This documentation is valid for this product.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

Step	Action
1	Go to the Schneider Electric home page www.schneider-electric.com .
2	In the Search box type the reference of a product or the name of a product range. <ul style="list-style-type: none">● Do not include blank spaces in the reference or product range.● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the Product Datasheets search results and click on the reference that interests you. If you entered the name of a product range, go to the Product Ranges search results and click on the product range that interests you.
4	If more than one reference appears in the Products search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the datasheet.
6	To save or print a datasheet as a .pdf file, click Download XXX product datasheet .

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Registered Trademarks

Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and/or other countries.

Product names used in this manual may be the registered trademarks owned by the respective proprietors.

Related Documents

You can download the manual related to this product, such as the software manual, from our website at www.schneider-electric.com.

Product Related Information

In the event this product does not run properly due to whatever reason, it may be difficult or impossible to identify a function. Functions that may present a hazard if not immediately executed, such as a fuel shut-off, must be provided independently of this product. The machine's control system design must take into account the operator being unable to control the machine or making mistakes in the control of the machine.

 WARNING
UNINTENDED EQUIPMENT OPERATION
The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter, and apply this product.
Follow all local and national safety standards.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

Chapter 1

Overview

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Package Contents	10
Certifications and Standards	11
Federal Communication Commission Radio Frequency Interference Statement - For USA	13
Hazardous Location Installation - For USA and Canada	14
European (CE) Compliance and KC Markings	16

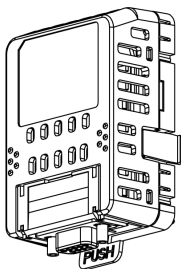
Package Contents

Package Contents

NOTE: This product has been carefully packed with special attention to quality. However, should you find anything damaged or missing, please contact your local distributor immediately.

Verify all items listed here are present in your package:

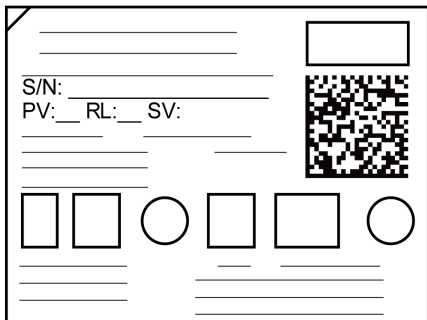
1



- 1 One of the following products: 1
 - PROFIBUS DP Slave/MPI Unit (part number: HMIZGPDP)
 - CANopen Slave Unit (part number: HMIZGCAN)
- 2 Instruction Sheet: 1
- 3 Chinese RoHS flyer: 1

Revision

You can identify the product version (PV), revision level (RL), and the software version (SV) from the product level.



Certifications and Standards

Some products are not subject to certification and standards. And some products have not received their certification and standards but are scheduled for assessment.

The certifications and standards listed below may include those that are not yet acquired for this product. For the latest certifications and standards that this product has acquired, please check the product marking or the following URL.

www.schneider-electric.com

Agency Certifications

Schneider Electric submitted this product for independent testing and qualification by third-party listing agencies. These agencies have certified this product as meeting the following standards.

- Underwriters Laboratories Inc., UL 508 and CSA C22.2 N^o142, Industrial Control Equipment
- Underwriters Laboratories Inc., ANSI/ISA 12.12.01 and CSA C22.2 N^o213, Electrical Equipment for Use in Class I, Division 2 Hazardous (Classified) Locations
- IECEx/ATEX for use in zones 2/22
- EAC certification (Russia, Belarus, Kazakhstan)

Compliance Standards

Europe:

CE

- Directive 2014/35/EU (Low Voltage)
- Directive 2014/30/EU (EMC)
 - Programmable Controllers: EN 61131-2
 - EN61000-6-4
 - EN61000-6-2
- Directive 2014/34/EU (ATEX)
 - EN60079-0
 - EN60079-15
 - EN60079-31

Australia:

RCM

- EN61000-6-4

Korea:

KC

- KN11
- KN61000-6-2

Qualifications Standards

Schneider Electric voluntarily tested this product to additional standards. The additional tests performed, and the standards under which the tests were conducted, are specifically identified in General Specifications (*see page 28*).

Hazardous Substances

This product is a device for use in factory systems. When using this product in a system, the system should comply with the following standards in regards to the installation environment and handling:

- WEEE, Directive 2012/19/EU
- RoHS, Directive 2011/65/EU and 2015/863/EU
- RoHS China, Standard GB/T 26572
- REACH regulation EC 1907/2006

Federal Communication Commission Radio Frequency Interference Statement - For USA

FCC Radio Interference Information

This product has been tested and found to comply with the Federal Communications Commission (FCC) limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial, industrial or business environment. This product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause or be subject to interference with radio communications. To minimize the possibility of electromagnetic interference in your application, observe the following two rules:

- Install and operate this product in such a manner that it does not radiate sufficient electromagnetic energy to cause interference in nearby devices.
- Install and test this product to ensure that the electromagnetic energy generated by nearby devices does not interfere with the operation of this product.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this product.

WARNING

ELECTROMAGNETIC / RADIO INTERFERENCE

Electromagnetic radiation may disrupt the operation of this product leading to unintended equipment operation. If electromagnetic interference is detected:

- Increase the distance between this product and the interfering equipment.
- Reorient this product and the interfering equipment.
- Reroute power and communication lines to this product and the interfering equipment.
- Connect this product and the interfering equipment to different power supplies.
- Always use shielded cables when connecting this product to a peripheral device or another computer.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Hazardous Location Installation - For USA and Canada

General

This product has been designed with the intention of meeting the requirements of Class I, Division 2 hazardous location application. Division 2 locations are those locations where ignitable concentrations of flammable substances are normally confined, prevented by ventilation, or present in an adjacent Class I, Division 1 location, but where an abnormal situation might result in intermittent exposure to such ignitable concentrations.

While this product is a non-incendive device under ANSI/ISA 12.12.01 and CSA C22.2 N°213, it is not designed for, and should never be used within a Division 1 (normally hazardous) location.

This product is suitable for use in Class I, Division 2, Groups A, B, C, and D hazardous locations or in non-hazardous locations. Before installing or using this product, confirm that the ANSI/ISA 12.12.01 or CSA22.2 N°213 certification appears on the product labeling.

NOTE: Some products are not yet rated as suitable for use in hazardous locations. Always use your product in conformance with the product labeling and this manual.

DANGER

POTENTIAL FOR EXPLOSION

- Suitable for use in Class I, Division 2, Groups A, B, C, and D hazardous locations.
- Substitution of any component may impair suitability for Class I, Division 2.
- Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- Always confirm that this product is suitable for use in hazardous locations by checking the ANSI/ISA 12.12.01 or CSA C22.2 N°213 certification appears on the product labeling.
- Do not attempt to install, operate, modify, maintain, service, or otherwise alter this product except as permitted in this manual. Unpermitted actions may impair the suitability of this product for Class I, Division 2 operation.

Failure to follow these instructions will result in death or serious injury.

 **DANGER****POTENTIAL FOR EXPLOSION**

- Always confirm the ANSI/ISA 12.12.01 or CSA C22.2 N°213 hazardous location rating of your device before installing or using it in a hazardous location.
- Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous. This applies to all connections including power, ground, serial, parallel, and network connections.
- Never use unshielded / ungrounded cables in hazardous locations.
- When enclosed, keep enclosure doors and openings closed at all times to avoid the accumulation of foreign matter inside the workstation.

Failure to follow these instructions will result in death or serious injury.

Make sure that this product is properly rated for the location. If the intended location does not presently have a Class, Division and Group rating, then users should consult the appropriate authorities having jurisdiction in order to determine the correct rating for that hazardous location.

Operation and Maintenance

The systems have been designed for compliance with relevant spark ignition tests.

 **DANGER****POTENTIAL FOR EXPLOSION**

In addition to the other instructions in this manual, when installing this product in a hazardous location, wire the equipment in accordance with the National Electrical Code article 501.10 (B) for Class I, Division 2 hazardous locations.

Failure to follow these instructions will result in death or serious injury.

European (CE) Compliance and KC Markings

CE Compliance Note

The product described in this manual comply with the European Directives concerning Electromagnetic Compatibility and Low Voltage (CE marking) when used as specified in the relevant documentation, in application for which they are specifically intended, and in connection with approved third-party products.

KC Markings

사용자안내문

기종별	사용자안내문
A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Chapter 2

Device Connectivity

System Design

This product is an accessory for the Harmony GTU.

By attaching this product to the Harmony GTU Box Module (hereafter referred to as "Box Module"), you can join a fieldbus network to communicate with master or slave equipment on the same network.

NOTE:

- For part numbers of the Harmony GTU Box Module, refer to the Harmony GTU User Manual.
- For details on the system structure or connection methods, refer to the corresponding device driver manual for your screen editing software.

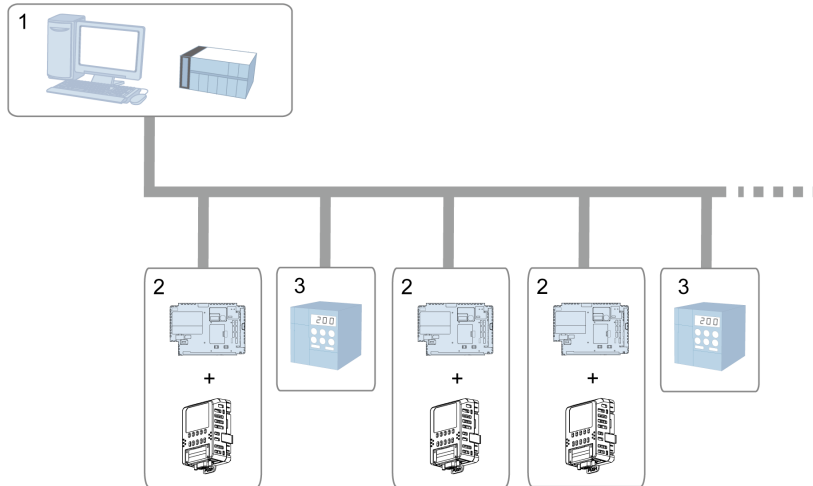
PROFIBUS DP Slave/MPI Unit

By attaching this product to the Box Module, you can join a PROFIBUS DP network or MPI network to communicate with PROFIBUS DP master or MPI equipment.

Use your screen editing software to set up this product as either a PROFIBUS DP slave unit or MPI unit.

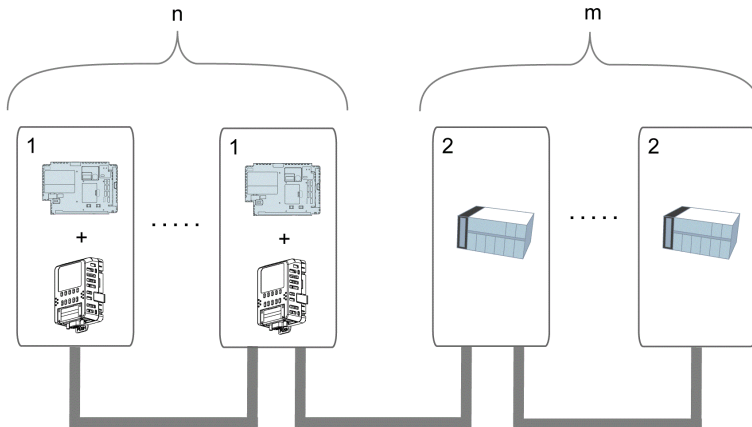
NOTE: This product supports PROFIBUS DP-V0.

PROFIBUS DP Network



- 1 PROFIBUS DP master PC/PLC
- 2 PROFIBUS DP Slave/MPI Unit + Box Module
- 3 Other PROFIBUS DP slave equipment

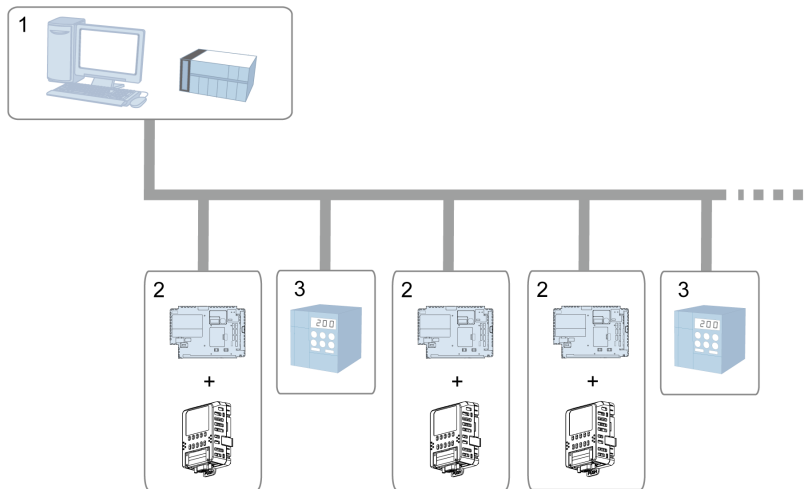
MPI Network



- 1 PROFIBUS DP Slave/MPI Unit + Box Module
- 2 MPI equipment

CANopen Slave Unit

By attaching this product to the Box Module, you can join a CANopen network to communicate with a CANopen master.



- 1 CANopen master PC/PLC
- 2 CANopen Slave Unit + Box Module
- 3 Other CANopen slave equipment

Chapter 3

Parts Identification and Functions

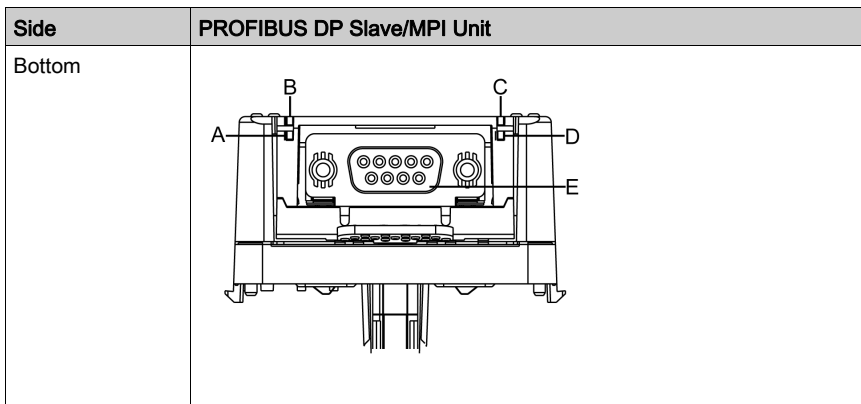
What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Parts Identification	22
LED Indications	24

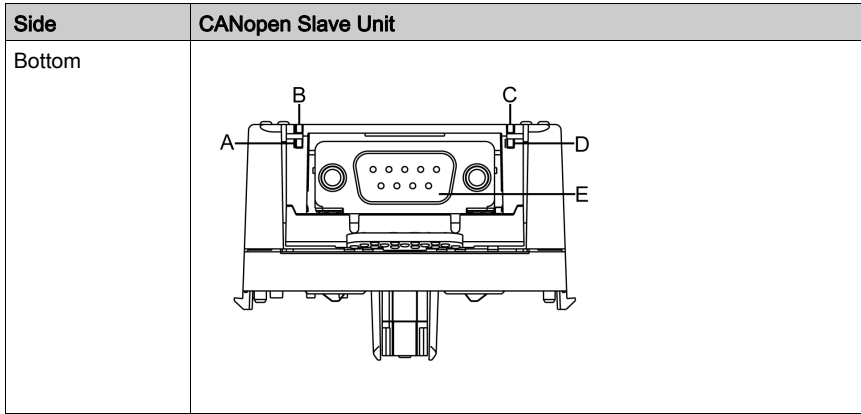
Parts Identification

PROFIBUS DP Slave/MPI Unit



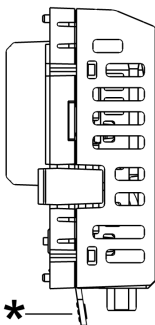
Part	Name	Description
A	Status LED	<i>(see page 24)</i>
B	Status LED	
C	Status LED	
D	Status LED	
E	PROFIBUS DP/MPI interface	-

CANopen Slave Unit



Part	Name	Description
A	Status LED	<i>(see page 24)</i>
B	Status LED	
C	Status LED	
D	Status LED	
E	CANopen interface	-

NOTE: Do not use the item marked with an asterisk (*), as shown in the image below.



LED Indications

PROFIBUS DP

Status LED				
Position	LED name	Color	Indicator	Description
A	RUN	Green	ON	Normal operation
B	BF (Bus Failure)	Red	ON	Bus fault Device is not in data exchange mode.
			OFF	No bus fault
C	SF (System Failure)	Red	ON	Device does not detect other masters on the bus.
			OFF	No fault
D	-	-	-	(Not applicable)

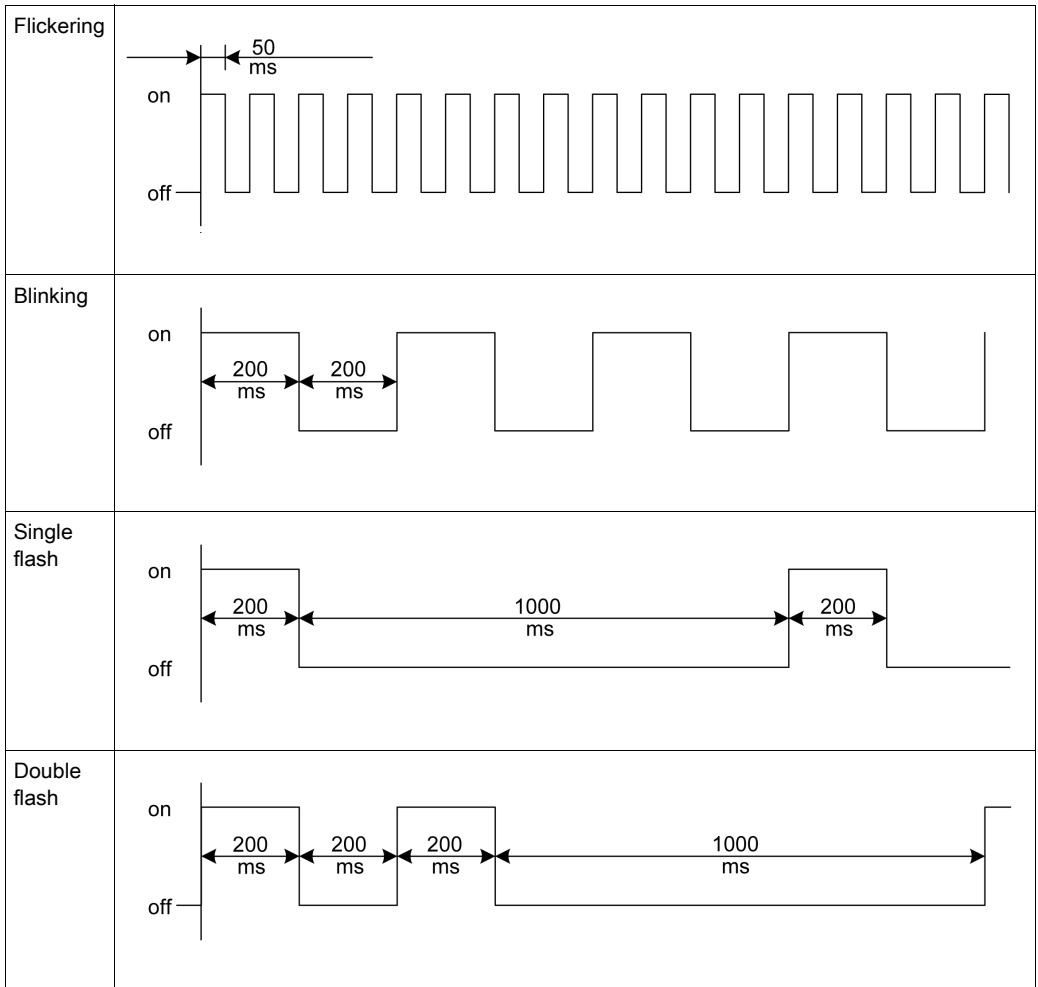
MPI

Status LED				
Position	LED name	Color	Indicator	Description
A	RUN	Green	ON	Normal operation
B	-	-	-	(Not applicable)
C	-	-	-	(Not applicable)
D	-	-	-	(Not applicable)

CANopen

Status LED				
Position	LED name	Color	Indicator*1	Description
A	RUN	Green	ON	Operational
			Blinking	Pre-operational
			Single flash	Stopped
B	ERR	Red	OFF	No error
			ON	Bus off
			Blinking	Invalid configuration
			Single flash	Warning limit reached
			Double flash	Heatbeat event
C	-	-	-	(Not applicable)
D	-	-	-	(Not applicable)

*1 The following illustrates the flash cycle.



Chapter 4

Specifications

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	General Specifications	28
4.2	Functional Specifications	32
4.3	Interface Specifications	34

Section 4.1

General Specifications

What Is in This Section?

This section contains the following topics:

Topic	Page
Electrical Specifications	29
Environmental Specifications	30
Structural Specifications	31

Electrical Specifications

Power supply	Rated input voltage	3.3 Vdc (Supplied by the Box Module)
	Power consumption	PROFIBUS DP Slave/MPI Unit: 1.3 W or less CANopen Slave Unit: 0.7 W or less
Voltage endurance		500 Vac, 20 mA for 1 minute (between SG terminal and FG terminal)
Insulation resistance		500 Vdc, 100 M Ω or more (between SG terminal and FG terminal)

Environmental Specifications

Physical environment	Surrounding air temperature	0...60 °C (32...140 °F)
	Storage temperature	-20...60 °C (-4...140 °F)
	Surrounding air and storage humidity	10%...90% RH (non-condensing, wet bulb temperature 39 °C [102.2 °F] or less)
	Dust	0.1 mg/m ³ (10 ⁻⁷ oz/ft ³) or less (non-conductive levels)
	Pollution degree	For use in Pollution Degree 2 environment
	Corrosive gases	Free of corrosive gases
	Atmospheric pressure (operating altitude)	800...1,114 hPa (2,000 m [6,561 ft] or lower)
Mechanical environment	Vibration resistance	IEC/EN 61131-2 compliant 5...9 Hz single amplitude 3.5 mm (0.14 in) 9...150 Hz fixed acceleration: 9.8 m/s ² X, Y, Z directions for 10 cycles (approximately 100 minutes)
	Shock resistance	IEC/EN 61131-2 compliant 147 m/s ² , X, Y, Z directions for 3 times
Electrical environment	Electrostatic discharge immunity	Contact discharge method: 6 kV Air discharge method: 8 kV (IEC/EN 61000-4-2 Level 3)

Air quality requirements

Do not operate or store the panel where chemicals evaporate, or where chemicals are present in the air:

- Corrosive chemicals: Acids, alkalines, liquids containing salt.
- Flammable chemicals: Organic solvents.

CAUTION

INOPERATIVE EQUIPMENT

Do not allow water, liquids, metal, and wiring fragments to enter inside this product.

Failure to follow these instructions can result in injury or equipment damage.

Structural Specifications

Grounding	Functional grounding: Grounding resistance of 100 Ω , 2 mm ² (AWG 14) or thicker wire, or your country's applicable standard (same for FG and SG terminals).
Cooling method	Natural air circulation
External dimensions (W x H x D)	60 x 87 x 41 mm (2.36 x 3.43 x 1.61 in)
Weight	100 g or less

Section 4.2

Functional Specifications

Transmission Specifications

PROFIBUS DP/MPI

Number of connectable units	Maximum 32 units per segment (without repeaters) Maximum 125 units per segment (with repeaters)									
Range of exchange numbers	1...125									
Transmission channel configuration	Bus configuration (multi drop)									
Transmission channel	Bus transmission channel: Twisted pair cable with shield (Extension of whole channel depends on the transmission speed)									
Transmission method	Half-duplex transmission, serial transmission, and comply with EIA RS-485									
Transmission setting	Data length: 8 bits Parity: Even Stop bit: 1 bit									
Data transmission speed (bps)/ Maximum transmission distance	9.6 K	19.2 K	93.75 K	187.5 K	500 K	1.5 M	3 M	6 M	12 M	
	1,200 m			1,000 m	400 m	200 m	100 m			
Encoding method	NRZ (Non Return Zero) method									
I/O Points ^{*1}	Input/Output: 1...112 words									

CANopen

NOTE: CANopen is the networking standard based on the international standard CAN. CANopen is defined as a uniform application layer by the DS301 specifications of the CiA (CAN in Automation).

Communication type	1:N
Transmission channel configuration	Bus configuration
Transmission method	Half-duplex transmission, serial transmission, CSMA/NBA

Data transmission speed (bps) ^{*1} / Maximum transmission distance	50 K	125 K	250 K	500 K	800 K	1,000 K
	1,000 m	500 m	250 m	100 m	40 m	20 m
Number of nodes ^{*1}	Node IDs: 1...127 PDO numbers: TPDO 64, RPDO 64					

*1 Set with the screen editing software.

Section 4.3

Interface Specifications

What Is in This Section?

This section contains the following topics:

Topic	Page
Interface Connection	35
Fieldbus Interfaces	36

Interface Connection

Cable Connections

DANGER

POTENTIAL FOR EXPLOSION

- Always confirm the ANSI/ISA 12.12.01 or CSA C22.2 N°213 hazardous location rating of your device before installing or using it in a hazardous location.
- Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous. This applies to all connections including power, ground, serial, parallel, and network connections.
- Never use unshielded / ungrounded cables in hazardous locations.
- When enclosed, keep enclosure doors and openings closed at all times to avoid the accumulation of foreign matter inside the workstation.

Failure to follow these instructions will result in death or serious injury.

Division 2 hazardous location regulations require that all cable connections be provided with adequate strain relief and positive interlock. Never connect or disconnect a cable while power is applied at either end of the cable. All communication cables should include a chassis ground shield. This shield should include both copper braid and aluminum foil. The D-sub style connector housing must be a metal conductive type (for example, molded zinc) and the ground shield braid must be terminated directly to the connector housing. Do not use a shield drain wire.

The outer diameter of the cable must be suited to the inner diameter of the cable connector strain relief so that a reliable degree of strain relief is maintained. Always secure the D-sub connectors to the workstation-mating connectors via the two screws located on both sides.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Remove all power from the device before removing any covers or elements of the system, and prior to installing or removing any accessories, hardware, or cables.
- Remove power before wiring this product's power terminals.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace and secure all covers or elements of the system before applying power to this product.
- Be sure to ground this product's FG terminal.

Failure to follow these instructions will result in death or serious injury.

Fieldbus Interfaces

DANGER

ELECTRIC SHOCK AND FIRE

When using the SG terminal to connect an external device to this product:

- Verify that a short-circuit loop is not created when you set up the system.
- Connect the SG terminal to remote equipment when the external device is not isolated.
- Connect the SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

Failure to follow these instructions will result in death or serious injury.

CAUTION

LOSS OF COMMUNICATION

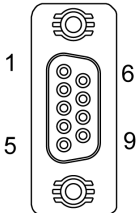
- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use a D-Sub 9 pin connector with jack screws.

Failure to follow these instructions can result in injury or equipment damage.

NOTE: Use within the rated current.

PROFIBUS DP / MPI Interface

D-Sub 9 pin socket connector

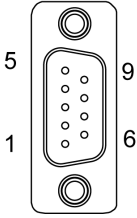
Product side	Pin No.	Signal name	Direction	Meaning
	1	NC	-	No connection
	2	NC	-	No connection
	3	RxD/TxD+	Input/Output	Send/Receive Data (+)
	4	CNTR-P	Output	Repeater control signal
	5	GND	-	Ground
	6	VCC	-	+5 Vdc (for termination resistance)
	7	NC	-	No connection
	8	RxD/TxD-	Input/Output	Send/Receive Data (-)
	9	NC	-	No connection
	Shell	FG	-	Functional ground

Interfit bracket is #4-40 (UNC).

NOTE: For information on connecting PROFIBUS DP Slave/MPI Unit and PROFIBUS DP master or MPI equipment, refer to the corresponding device driver manual for your screen editing software.

CANopen Interface

D-Sub 9 pin plug connector

Product side	Pin No.	Signal name	Direction	Meaning
	1	NC	-	No connection
	2	CAN_L	I/O	CAN_L bus line
	3	CAN_GND	-	CAN ground
	4	NC	-	No connection
	5	NC	-	No connection
	6	CAN_GND	-	CAN ground
	7	CAN_H	I/O	CAN_H bus line
	8	NC	-	No connection
	9	NC	-	No connection
	Shell	FG	-	Functional ground

Interfit bracket is #4-40 (UNC).

NOTE: For information on connecting CANopen Slave Unit and CANopen master, refer to the corresponding device driver manual for your screen editing software.

Chapter 5

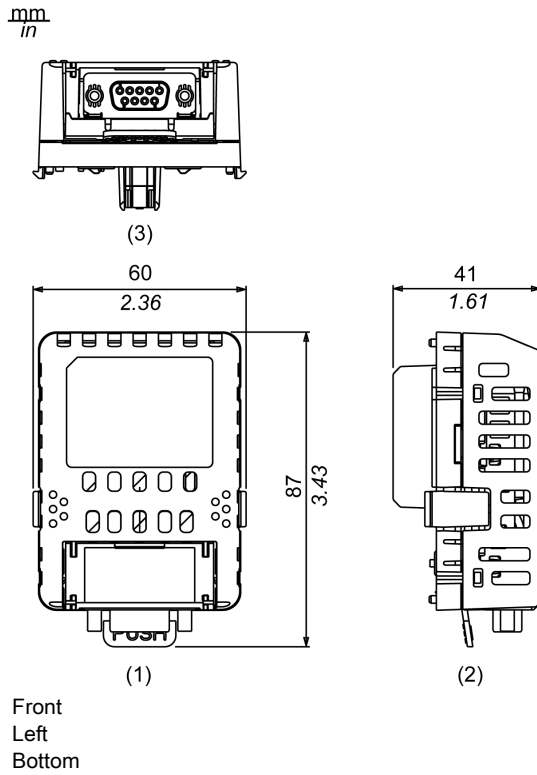
Dimensions

What Is in This Chapter?

This chapter contains the following topics:

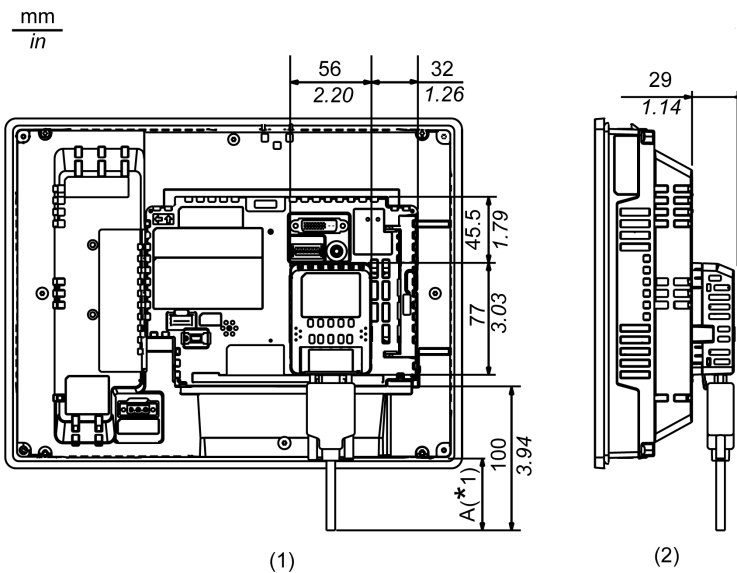
Topic	Page
External Dimensions	40
Dimensions with Cables	41

External Dimensions



Dimensions with Cables

NOTE: The following illustration is of the HMIDT642.



- 1 Rear
- 2 Left

*1 Refer to the following table for the length of A.

Series		Size	Model name	A
Harmony GTU	Smart Display	10 inch	HMIDT542	63 mm (2.48 in)
		12 inch	HMIDT642	50 mm (1.97 in)
			HMIDT643	
		15 inch	HMIDT732	22 mm (0.87 in)
		15 inch Wide	HMIDT752	39 mm (1.54 in)
	19 inch Wide	HMIDT952	5 mm (0.20 in)	
	Advanced Display	7 inch Wide	HMIDT351	96 mm (3.78 in)
		10 inch Wide	HMIDT551	71 mm (2.80 in)
		12 inch Wide	HMIDT651	55 mm (2.17 in)

NOTE:

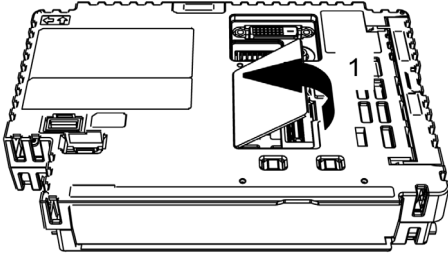
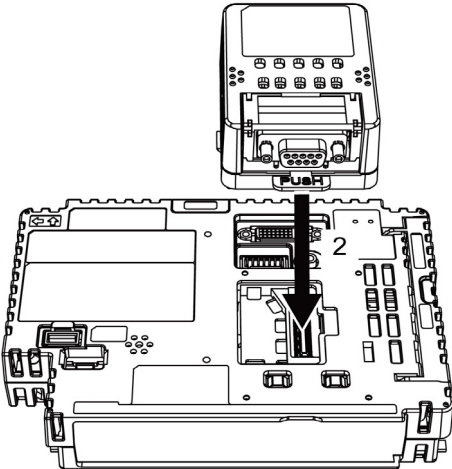
- All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.
- For information on the dimensions when the Box Module and Display Module are attached together, refer to the Harmony GTU User Manual.

Chapter 6

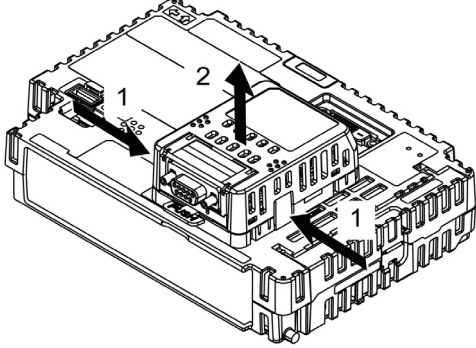
Installation

Installation Procedures

Attaching to Box Module

Step	Action
1	At the rear of the Box Module, open the cover in the direction shown by arrow 1 in the figure below. 
2	As shown by arrow 2, connect the interface at the back of this product to the interface inside the cover. 
3	Continue pressing until you hear a click. Check to make sure this product is fastened securely.

Removing from Box Module

Step	Action
1	<p>Push and hold the hooks at both sides of this product in the direction shown by the arrows (1), then lift the product (2) to unfasten it.</p> 
2	<p>After removing this product, reattach the cover that you removed during product installation back onto the rear of the Box Module.</p>

Index



C

caution

loss of communication, *36*

Certifications and Standards, *11*

connection, interface, *35*

D

danger

arc flash, *35*

electric shock, *35, 36*

explosion, *14, 15, 35*

fire, *14, 15*

DC power, *35*

F

functional specifications, *32*

I

installation, *43*

interface, DP, *36*

interface, MPI, *36*

P

parts identification, *22*

S

specifications

electrical, *29*

environmental, *30*

structural, *31*

transmission, *32*

system design, *17*

W

warning

electromagnetic interference, *13*

unintended equipment operation, *8*